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MCB CAMP LEJEUNE  
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FINAL NO ACTION DECISION DOCUMENT FOR SITE UXO-01 ASR 2.64 D6 FORMER  
SMALL ARMS RANGE MCB CAMP LEJEUNE NC  
3/1/2014  
OSAGE OF VIRGINIA

**FINAL**

**No Action Decision Document for  
Site UXO-01, ASR 2.64 (D6, Former Small Arms Range)**

**Marine Corps Installations East – Marine Corps Base Camp  
Lejeune  
Jacksonville, North Carolina**



**March 2014**

**Prepared for:  
Department of the Navy  
Naval Facilities Engineering Command  
Mid-Atlantic**



**Under:**

**Contract No. N40085-11-D-4017  
CTO No. 0003**

**Prepared by:**





## *No Action Decision Document*

*Site UXO-01, ASR 2.64 (D-6, Former Small Arms Range)  
Marine Corps Base Camp Lejeune, North Carolina  
March 2014*

### **1.0 Declaration**

This No Action Decision Document (NADD) presents the No Further Action (NFA) decision for Military Munitions Response Program (MMRP) Unexploded Ordnance Site 01 (UXO-01), the Former D-6, Small Arms Range. Site UXO-01 was a former small arms range, (Archives Search Report [ASR] 2.64), located at Marine Corps Installations East - Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ), North Carolina. MCIEAST-CAMLEJ was added to the United States Environmental Protection Agency (USEPA) National Priorities List (NPL), effective November 4, 1989 (EPA ID: NC6170022580). As a result of MCIEAST-MCB CAMLEJ being added to the NPL, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) required an interagency agreement known as a Federal Facility Agreement (FFA) between the USEPA, North Carolina Department of Environment and Natural Resources (NCDENR), the United States Navy (US Navy), and the United States Marine Corps (USMC). The FFA ensures that environmental impacts associated with past and present activities at the base are appropriately evaluated. As part of the MMRP, the Department of Defense (DoD), using CERCLA processes, is investigating closed ranges and disposal sites to evaluate the environmental impact from historical munitions use.

The NFA determination has been made in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan. This NFA decision is based on the results presented in the Preliminary Assessment/Site Inspection (PA/SI) completed by TetraTech, NUS and the Non-Time-Critical Removal Action (NTCRA) completed by Osage of Virginia, Inc., and the Administrative Record for MCIEAST-MCB CAMLEJ.

As a result of the NTCRA, it has been concluded that there is no unacceptable risk to human health or the environment from Site UXO-01 (ASR 2.64). This NADD is issued by the US Navy and the Marine Corps with concurrence from USEPA Region 4 and NCDENR. Copies of the USEPA and NCDENR approval letters are presented as Appendix A.

#### **1.1 Authorizing Signature**

R.F. CASTELLVI

Brigadier General, U.S. Marine Corps  
Commanding General

Marine Corps Installations East-Marine Corps Base Camp Lejeune

24 MARCH 2014

Date

## **2.0 Decision Summary**

This section contains site characterization information including site description, history, and nature and extent of contamination.

### **2.1 Facility and Site Description**

MCIEAST-MCB CAMLEJ is located in Onslow County, North Carolina, and covers approximately 236 square miles, including 14 miles of coastline. As shown on **Figure 1**, the Base is bounded to the southeast by the Atlantic Ocean and to the northeast by State Route 24. The town of Jacksonville, North Carolina, is located north of the Base.

The generally flat topography of the Base is typical of the seaward portions of the North Carolina coastal plain. Elevations at the Base vary from sea level to 72 feet above mean sea level (msl), although the elevation of the majority of the Base lies between 20 and 40 feet above msl.

#### **2.1.1 Facility and Site Physical Setting**

**Figure 2** shows the location of the former D-6, Small Arms Range site, which covers an approximate one-acre area within the Mainside area of the base. The former D-6, Small Arms Range site is located to the east of the New River, and downstream of Hadnot Point. As shown on **Figure 2**, the site encompasses former Building 451 and is located just northeast of the intersection of I Street and Julian C. Smith Road (formerly named River Road).

#### **2.1.2 Site History**

The USMC has conducted small-bore weapons training and marksmanship qualification activities at a number of ranges located at MCIEAST-MCB CAMLEJ, including the now demolished and removed D-6, Small Arms Range. Construction for MCIEAST-MCB CAMLEJ started in 1941 when the base was used as a Marine combat training area during World War II. MCIEAST-MCB CAMLEJ also served as a combat Marine training center for the Korean and Vietnam conflicts, the Gulf War, and subsequent Middle Eastern activities.

The former D-6, Small Arms Range description and history described here are summarized from the 2010 Engineering Evaluation / Cost Assessment (EE/CA) Report (TetraTech, 2010) and the NTCRA Scope of Work (NAVFAC, 2011). The firing range was fully enclosed inside Building 451 and was utilized from approximately 1953 to mid-1997. Building 451 was a Butler Building constructed of metal sheeting on a steel frame with concrete masonry unit (CMU)-lined walls and was constructed in November 1952. The building was approximately 120.5 feet long by 40 feet wide, and was demolished in 1998.

The site has remained vacant since the Building 451 demolition in 1998; however, significant undergrowth had filled in portions of the area. In addition, an eight-foot high chain-link fence was installed around Building 429, which is the building located adjacent-west of the site as shown on **Figure 2**. This fence is located, in part, within the former Building 451 investigation area, and was temporarily removed to perform the removal action and replaced following its completion.

## **2.2 Site Characteristics**

The D-6, Small Arms Range Site covers an approximately one-acre area within MCIEAST-MCB CAMLEJ. The site is approximately 700-feet northeast of the New River. The elevation at the site is relatively flat ranging from 11 to 13 feet above msl. To control surface runoff, a drainage ditch was installed along the northwestern side of I street, eventually discharging into the New River (TetraTech NUS, Inc. 2009).

Site-specific subsurface geology collected from soil cores indicate particle sizes ranging from clay to coarse/gravel size sand. Site-specific hydrogeologic information was derived from subsurface soil sampling and the installation of temporary monitoring wells screened within the shallow groundwater aquifer (10-20 feet below ground surface) (TetraTech NUS, Inc. 2009).

## **2.3 Previous Investigations**

A PA was conducted for the former D-6, Small Arms Range in September 2008 by TetraTech NUS, Inc. The PA results were used to develop the scope of a Site Inspection (SI), which was reported in an SI Report dated October 2009 (TetraTech NUS, Inc. 2009). Munitions constituents (MCs), resulting from the use of small arms ammunition, consisting of metals (lead, antimony, arsenic, copper, tin, and zinc) were detected within the soils in the D-6, Small Arms Range investigation area. The human health risk assessment (HHRA) conducted during the SI identified antimony, arsenic, and lead as chemicals of concern (COCs) in surface and subsurface soils. Arsenic and lead were identified as COCs in groundwater.

Lead was the primary MC of concern because it is the primary constituent in spent small arms munitions (typically 85 to 96 percent by weight) and because of lead's toxicity (TetraTech NUS, Inc. 2010). Concentrations of the other metals in soil were spatially correlated to be present with lead occurrences. Previous environmental investigations conducted at the D-6, Small Arms Range are summarized below.



### ***Preliminary Assessment, UXO-01 (TetraTech NUS, Inc. 2008)***

A site visit was conducted in September 2008; the findings of the site visit are documented in the SI Report (TetraTech NUS, Inc. 2009) and summarized here. The D-6, Small Arms Range was located inside Building 451. Built in 1952, Building 451 was a 120.5 feet long by 40-feet wide cinder block construction Butler Building. The bullet trapping system consisted of four angled steel plate baffle plates and a sand layer. The sand would catch the expended bullets and/or bullet fragments as they passed through the targets and deflected through the baffle plates. The building housed eight firing lanes and accommodated target practice firing from 50 to 75 feet. The building was demolished in 1998. Non-native fill material may have been used in backfilling after the building demolition, potentially pushing surface soil MC contamination from range activities below the clean fill.

### ***Site Inspection, UXO-01 (TetraTech NUS, Inc. 2009)***

#### **Soil**

During the SI, the former D-6, Small Arms Range site was divided into a four-part grid with five sample locations each, for a total of 20 grid sample locations. Three additional samples were collected from within a drainage ditch located just northeast of the D-6, Small Arms Range area. Soil samples were analyzed for antimony, arsenic, copper, lead, nickel, tin, and zinc.

Lead was detected in both surface and subsurface soil samples. Seven of 20 discrete surface soil samples (defined as ground surface to 0.5 below ground surface [bgs]), excluding the ditch samples, exhibited lead concentrations above the NCDENR Hazardous Waste Section Soil Screening Level (SSL) for residential soil of 270 milligrams per kilogram (mg/kg). Four of nine subsurface soil samples collected from ground surface to two feet bgs exhibited lead concentrations above the North Carolina SSL for residential soil. The maximum lead concentration detected in the upper two feet of soil was 60,400 mg/kg, based upon the fixed-based laboratory result, in a location coincident with the northeast corner of the former building in the vicinity of the former bullet trap. Lead concentrations in the three surface soil samples collected from within the drainage ditch to the northeast of the D-6 Small Arms area were detected below the North Carolina SSL.

Two samples in the two to four foot depth interval exhibited lead concentrations above the North Carolina SSL at concentrations ranging from 793 mg/kg to 1,140 mg/kg. Lead concentrations were not detected above the North Carolina SSL in soil samples collected at depths greater than four feet bgs.

Antimony was detected at concentrations greater than the North Carolina SSL of 5.42 mg/kg in soil from two locations, with a maximum detected concentration

of 493 mg/kg detected in a soil sample from the ground surface to two feet bgs depth. The locations with maximum antimony soil concentrations coincided with locations where elevated lead concentrations were detected, and were located in the vicinity of the former bullet trap.

Arsenic was detected in all soil samples at concentrations below the North Carolina SSL of 26.2 mg/kg. The maximum detected arsenic concentration in soil was 4.9 mg/kg in a soil sample from the ground surface to two feet bgs depth interval. This arsenic soil concentration was the only soil detection above the NCDENR Inactive Hazardous Sites Branch Soil Remediation Goal (SRG), which is 4.4 mg/kg for arsenic (NCDENR, 2011). Arsenic in soil from all other boring locations was detected at concentrations below the NCDENR SRG. This soil sample location also coincided with the sample location discussed above where both elevated lead and antimony concentrations were detected. **Table 1** provides a summary of screening level results for soil samples collected during the SI.

*Table 1 – PA/SI Surface and Subsurface Soil Screening Results (Tetra Tech NUS, Inc. 2009).*

Chemical Name (mg/kg)	Surface Soil Maximum Detected Concentration	Subsurface Soil Maximum Detected Concentration	USEPA RSLs <sup>(1)</sup>		North Carolina Soil Screening Levels <sup>(2)</sup>
			Residential Soil	Risk-Based SSL (Protection of Groundwater)	
Antimony	493	4.6	3.1	0.66	5.42
Arsenic	4.9	3.1	0.39	0.0013	26.2
Copper	27.6	2.1	310	51	704
Lead	60,400	1,140	400	NA	270
Nickel	7.2	2.3	150	48	56.4
Tin	23.2	NA	2,200	5,500	NA
Zinc	209	36.8	2,300	680	550

1 – USEPA Regional Screening Level, April 2009, Updated May 19, 2009.

2 – North Carolina Hazardous Waste Section Soil Screening Level Concentrations (NCDENR, 2005)

mg/kg – milligrams per kilogram

SSL – Soil Screening Level

Shaded criterion indicates that concentration exceeds any screening level

## Groundwater

Four temporary groundwater monitoring wells were installed and sampled during the SI. Groundwater samples were analyzed for antimony, arsenic, copper, lead, nickel, tin, and zinc. Total lead was detected above the 15 North Carolina Administrative Code (NCAC) 2L Groundwater Standard for lead of 15 micrograms per liter (µg/L) in unfiltered samples from these four temporary groundwater monitoring wells. Groundwater samples from three of the four locations exhibited elevated turbidity levels above 300 nephelometric turbidity units (NTU). Both total and dissolved (unfiltered and filtered) samples were collected and analyzed from these three temporary monitoring well locations (TW-004, TW-012, and TW-019). Dissolved lead concentrations in the three filtered groundwater samples were either below the NCAC 2L Groundwater Standard for lead of 15 µg/L (TW-004 at 4.7 µg/L) or were not detected above a

detection limit of 2.5 µg/L (TW-012 and TW-019). The total lead concentration in unfiltered groundwater from TW-007 was above the NCAC 2L Groundwater Standard at a concentration of 22.2 µg/L.

Total Arsenic was detected in the TW-004 unfiltered groundwater sample above its NCAC 2L Groundwater Standard of 10 µg/L. The dissolved arsenic concentration in the filtered groundwater sample from TW-004 was below the NCAC 2L Groundwater Standard, and additional sampling was not required.

**Table 2** provides a summary of screening level results for groundwater samples collected during the SI.

*Table 2 – PA/SI Groundwater Screening Results (Tetra Tech NUS, Inc. 2009).*

Chemical Name	Groundwater Max Concentration	USEPA RSLs Tap Water <sup>(1)</sup>	North Carolina Groundwater Standards <sup>(2)</sup>
Arsenic	55.1	0.045	50
Copper	24.5	150	1,000
Lead	117	15	15
Nickel	21.7	73	100
Nickel (Filtered)	4.8	73	100
Zinc	272	1,100	1,050
Perchlorate	0.19 J	2.6	NA

1 – USEPA Regional Screening Level, April 2009, Updated May 19, 2009.

2 – Classification and Water Quality Standards Applicable to the Groundwaters of North Carolina (NCAC, 2005).

J – Analyte present, reported value may not be accurate or precise.

NA – Not Available or Not Applicable

USEPA – United States Environmental Protection Agency

µg/L – micrograms per Liter

Shaded criterion indicates that concentration exceeds any screening level

### ***Final EE/CA for NTCRA, UXO-01 (TetraTech NUS, Inc. 2010)***

An EE/CA was prepared in 2010 (TetraTech NUS, Inc. 2010) and the following Removal Action Objectives (RAOs) were established:

- Mitigate human health and environmental risks through removal of arsenic, lead, and antimony contaminated soil above levels suitable for unlimited use and unrestricted exposure.
- Mitigate potential leaching of contaminants (i.e., lead) in soil to groundwater through removal of contaminated soil.

The EE/CA compared and evaluated the following four options to achieve the RAOs for the former D-6, Small Arms Range. The evaluation process consisted of screening each alternative based on the effectiveness of the proposed remediation, the ease of implementation, and both the total and future costs associated with the remediation process. The alternatives evaluated are listed on the following page:



- Alternative 1 – No Action
- Alternative 2 – Excavation and Off-Site Disposal
- Alternative 3 – In-Situ Phytoremediation
- Alternative 4 – Ex-Situ Soil Washing

Alternative 2 was selected as the recommended removal action for the site. North Carolina SRGs were chosen as surface soil and subsurface soil cleanup goals for the chemicals of potential concern (COPCs) identified at the former D-6, Small Arms Range Site. The North Carolina SRGs served as the preliminary remediation goals (PRGs), also established as the Project Action Limits (PALs), presented below:

- Antimony – 6.3 mg/kg
- Arsenic – 4.4 mg/kg
- Lead – 400 mg/kg

***Non-Time-Critical Removal Action, UXO-01 (Osage of Virginia, 2013)***

The removal action for the D-6, Small Arms Range consisted of excavation of contaminated soil with lead, arsenic, and antimony for off-site disposal and monitoring well installation with groundwater sampling. Soil with COC concentrations above PALs was removed through soil excavation and disposal to an off-site landfill to prevent contaminant migration and reduce the overall environmental risks at the site. The lead in soil was stabilized in place using EnviroBlend 90/10 prior to excavating and disposing off-site at Waste Industries Sampson County Landfill in Roseboro, NC, a subtitle D landfill.

The total area of removal was estimated to be 6,917 square feet (sf), and the total volume removed was initially estimated to be 428 cubic yards (cy). As shown in **Figure 3**, soil was excavated to depths ranging from 1 foot to 4 feet bgs. Following soil removal, composite confirmatory samples were collected to show that the removal action removed the COCs to concentrations below PALs. Once soil removal was complete and the site was backfilled, five groundwater monitoring wells were installed to evaluate the site groundwater total lead concentrations. Two rounds of groundwater sampling were conducted that demonstrated total lead was not present in site groundwater above the limit of detection of 4.0 µg/L, which is below the MCL and NCAC 2L groundwater standards. The analytical results from the NTCRA are summarized in **Tables 3 and 4**.

**Table 3 – Final Composite Post-Excavation Base Soil Samples Results (Osage of Virginia, 2013)**

Sample ID	Project Action Limit <sup>(1)</sup> (mg/kg)	EP-1	EP-2	EP-4	EP-5	EP-7	EP-8	EP-9	EP-13
Lab Sample ID		SF4688-001	SF4688-002	SF5260-001	SF5260-002	SF5260-004	SF5260-005	SF5632-001	SF6145-001
Sample Date		7/24/12	7/24/12	8/13/12	8/13/12	8/13/12	8/13/12	8/23/12	9/11/12
Antimony (mg/kg)	6.3	0.32 J	0.93	1.2	3.4	0.92	0.33 J	0.06 J	0.41 J
Arsenic (mg/kg)	4.4	0.54 J	0.56 J	0.53	3.4	0.91	1.2	1.9	0.62 J
Lead (mg/kg)	400	21.0	118	160	47.0	26.8	4.2	16.8	10.5

1 - Project Action Limits defined within the EE/CA Report (Tetra Tech NUS, Inc. 2010).

Sample IDs are preceded by MMRP64 for site identification in the laboratory reports.

EP-11 and EP-12 were delayed in shipment to the laboratory and received out of temperature and were not analyzed. Instead, EP-13 was recollected across the entire area.

Soil with concentration above the PALs (EP-3, EP-6, and EP-10) was subsequently treated with EnviroBlend, sampled to confirm that it was non-hazardous, excavated, and sent off-site for disposal

J – Analyte present, reported value is estimated

mg/kg – milligrams per kilogram

**Table 4 – Post Excavation Groundwater Sample Results (Osage of Virginia, 2013)**

Sample ID	North Carolina Groundwater Standards <sup>(1)</sup> (µg/L)	MW-01		MW-02		MW-03		MW-04		MW-05	
Lab Sample ID		SF7593-001	SG0506-001	SF7593-002	SG0506-002	SF7593-003	SG0506-003	SF7593-004P	SG0506-004	SF7593-006	SG0506-005
Sample Date		10/30/12	1/22/13	10/30/12	1/22/13	10/30/12	1/22/13	10/30/12	1/22/13	10/30/12	1/22/13
Lead (µg/L)	15	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U

1 – Classification and Water Quality Standards Applicable to the Groundwaters of North Carolina (NCAC, 2005).

Sample IDs are preceded by MMRP64 for site identification in the laboratory reports.

µg/L – micrograms per Liter.

U – Analyte was not detected at the indicated concentration.

## 2.4 Current and Potential Future Land and Resource Uses

Current land use at the former D-6, Small Arms Range is primarily an undeveloped one-acre parcel of land that sits among developed areas at MCIEAST–MCB CAMLEJ. The majority of the site is open land, with the remaining portion heavily wooded. No changes in the site’s land use designation are expected in the foreseeable future.

## **2.5 Summary of Human Health Screening**

During the SI (TetraTech NUS, Inc. 2009), a HHRA evaluation was conducted. The purpose of the human health risk screening evaluation is to conservatively estimate risks posed to potential human receptors from chemicals present at the D-6, Small Arms Range. The risk screening evaluation included the following general steps involved in a baseline human health risk evaluation: identification of COPCs, exposure assessment, risk characterization, and uncertainty analysis.

Based upon the 2009 SI data, the human health risk screening identified lead, antimony, and arsenic as COPCs in surface and subsurface soil and lead and arsenic in groundwater. The arithmetic mean concentration of lead in surface soil, subsurface soil, and groundwater (unfiltered) exceeded the USEPA and NC screening levels. Prior to the NTCRA (discussed on pages 7 and 8 above), adverse health effects could be anticipated from exposures to lead in soil and groundwater.

Following the NTCRA, antimony, arsenic, and lead were demonstrated to be present in soil at concentrations below PALs and groundwater lead concentrations were confirmed to be below the lead detection limit, which was well below the NCAC 2L Groundwater Standard. Additional sampling for arsenic in groundwater was not required because the dissolved arsenic concentration in the filtered SI groundwater sample was below the NCAC 2L Groundwater Standard.

## **2.6 Summary of Ecological Risk Screening**

During the SI (TetraTech NUS, Inc. 2009) an Ecological Risk Screening Evaluation (ERSE) was conducted. Surface soil, subsurface soil and groundwater data were screened against ecological screening values intended to be protective of ecological receptors. The primary ecological receptors of concern include soil invertebrates, terrestrial plants, small herbivorous birds and mammals, small insectivorous birds and mammals, and aquatic organisms (fish and benthic invertebrates).

The surface soil risk screening summarized was performed by comparing maximum and arithmetic mean chemical concentrations to the lower of USEPA Ecological Screening Levels (Eco-SSLs) for invertebrates, plants, mammals, and birds and to USEPA Region 4 Ecological Screening Values (ESVs) (USEPA, 2001) for chemicals that do not have an Eco-SSL. The groundwater risk screening was performed by comparing maximum and arithmetic mean chemical concentrations to the USEPA Region 4 ESVs (USEPA, 2001) for freshwater surface water to evaluate shallow groundwater.

Lead, antimony, and zinc were identified as COPCs in surface soil, however only lead and antimony were used for food-chain modeling. Food-chain model

ecological effect quotients (EEQs) using average concentrations and average exposure parameters were greater than 1.0 for lead in all ecological receptors (vole, quail, shrew, and woodcock). Similar model EEQs were above 1.0 for antimony in only the vole and shrew. (TetraTech, 2010)

Lead, antimony, and zinc were initially selected as surface soil ecological COPCs because the maximum detected concentrations exceeded ecological screening levels (ESLs). Lead and antimony were retained as ecological COPCs following further refinement of receptor classes, spatial distribution of chemical concentrations, and average concentrations at the site (TetraTech, 2010). Surface soil with elevated lead and antimony concentrations exceeding PALs was removed during the NTCRA.

## **2.7 No Action Determination**

Based on the results of previous investigations, and the NTCRA, it has been concluded that NFA is warranted at Site UXO-01, the former D-6, Small Arms Range. The US Navy and USMC, with concurrence from USEPA Region 4 and NCDENR, have agreed the NFA action is warranted. This determination is based on the following:

- Composite confirmatory soil samples were collected to show that the NTCRA removed the COCs to concentrations below PALs.
- Groundwater sampling conducted after the NTCRA demonstrated that total lead was not present in site groundwater above the limit of detection, which is well below the MCL and NCAC 2L groundwater standard.

## **2.8 Community Participation**

Information regarding the environmental cleanup of sites at MCIEAST-MCB CAMLEJ is made available to the public through the community relations program, which includes a Restoration Advisory Board, public meetings, the Administrative Record file for the site, and announcements published in local newspapers. Public meetings with the Restoration Advisory Board are held quarterly and allow information exchange between community members, the Navy, MCIEAST-MCB CAMLEJ, USEPA, and NCDENR.

## References

NCDENR. 1991. *Division of Land Resources Land Quality Section Erosion and Sediment Control Field Manual*. February.

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USEPA, 2001. Region 4 *Ecological Risk Assessment Bulletins – Supplement to RAGS*. Effective April 20. <http://www.epa.gov/region04/waste/ots/ecolbul.htm>

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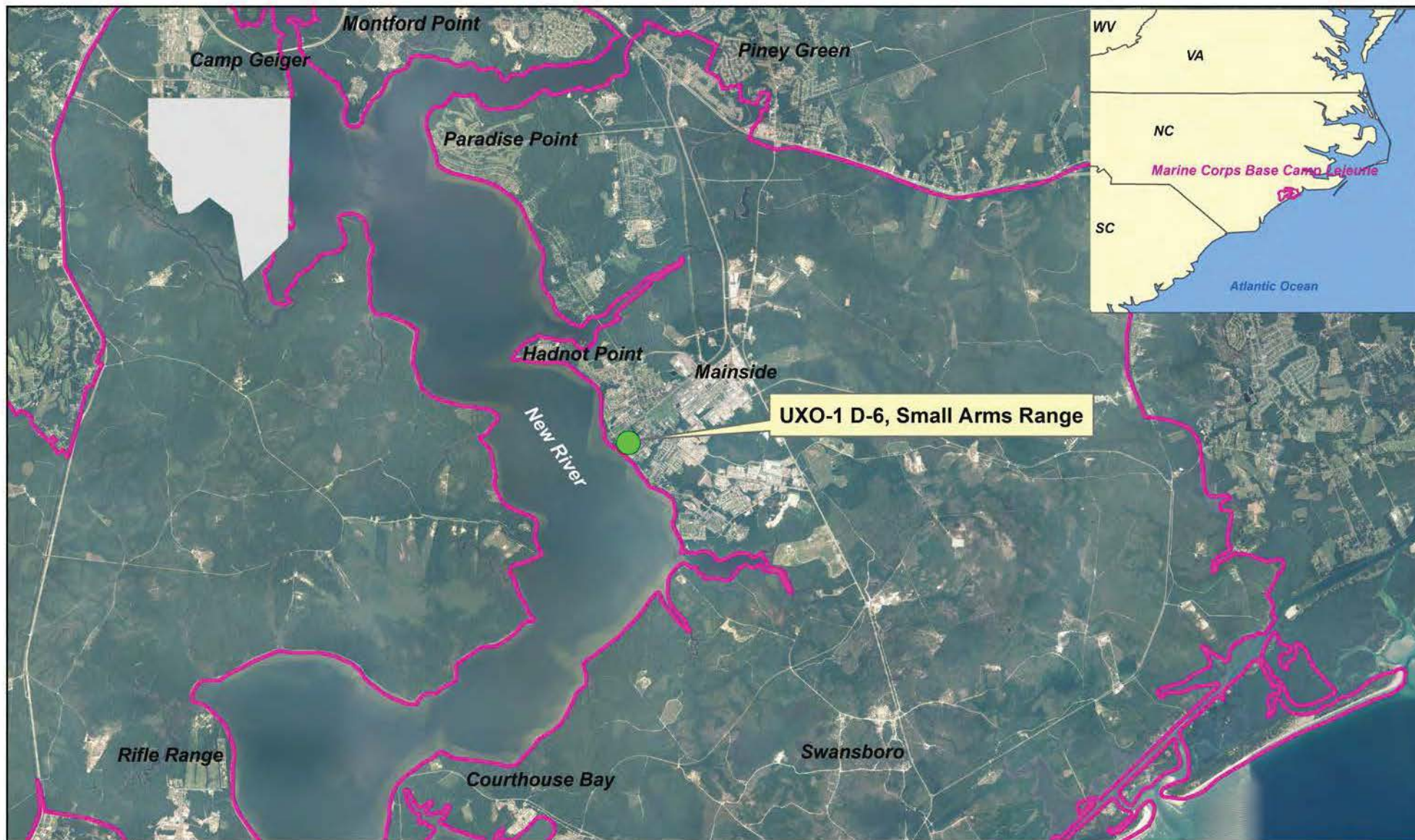
## Acronyms and Abbreviations

ASR	Archives Search Report
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMU	concrete masonry unit
COCs	chemicals of concern
COPCs	chemicals of potential concern
cy	cubic yard
DoD	Department of Defense
Eco-SSLs	Ecological Screening Levels
EE/CA	Engineering Evaluation/Cost Analysis
EEQs	ecological effect quotients
EP	environmental probe (boring location label)
ERSE	Ecological Risk Screening Evaluation
ESVs	Ecological Screening Values
FFA	Federal Facility Agreement
HHRA	Human Health Risk Assessment
MC	munitions constituents
MCIEAST-MCB	Marine Corps Installations East – Marine Corps Base Camp Lejeune
CAMLEJ	
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
µg/L	micrograms per liter
msl	mean sea level
MMRP	Military Munitions Response Program
MW	monitoring well
NADD	No Action Decision Document
NAVFAC	Naval Facilities Engineering Command
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NFA	No Further Action
NPL	National Priorities List
NTCRA	Non-Time-Critical Removal Action
NTU	nephelometric turbidity units





## **Acronyms and Abbreviations (continued)**

PA	Preliminary Assessment
PALs	Project Action Limits
PRG	Preliminary Remediation Goals
RAO	Removal Action Objective
RCRA	Resource Conservation and Recovery Act
RSL	Regional Screening Level
SARA	Superfund Amendments and Reauthorization Act
sf	square feet
SI	Site Inspection
SRG	Soil Remediation Goal
SSL	Soil Screening Level
USEPA	United States Environmental Protection Agency
USMC	United States Marine Corps
US Navy	United States Navy
UXO	unexploded ordnance



Legend

-  UXO-1 D-6, Small Arms Range
-  Camp Lejeune Base Boundary



0 6,250 12,500 25,000  
Feet

**Figure 1**  
Aerial Site Location Map  
Marine Corps Base Camp Lejeune  
North Carolina







Legend

— Fence Line

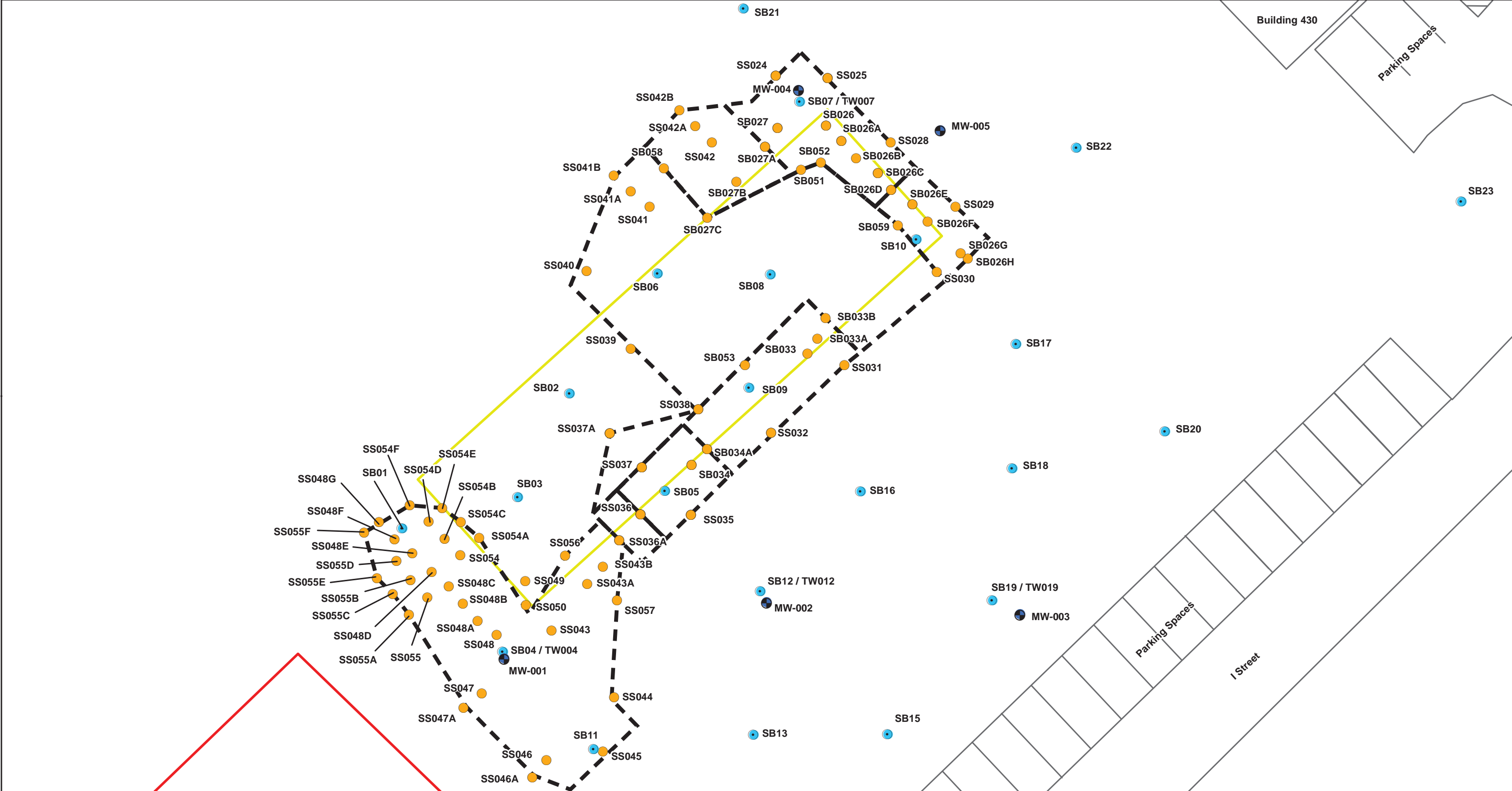
□ Demolished Building 451



0 50 100 150 300  
Feet

**Figure 2**  
D-6, Small Arms Range  
Marine Corps Base Camp Lejeune  
North Carolina





Legend

- Monitoring Well
- Soil Sample Location - Tetra Tech 2009
- Soil Sample Location - Osage 2012
- Fence Line
- Soil Excavation Area
- Demolished Building 451 Footprint
- Digitized Features

**Figure 3**  
Previous Investigations Map  
D-6, Small Arms Range  
Marine Corps Base Camp Lejeune  
North Carolina



# Appendix A

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North Carolina Department of Environment and Natural Resources  
Division of Waste Management

Pat McCrory  
Governor

Dexter R. Matthews  
Director

John E. Skvarla, III  
Secretary

May 13, 2013

NAVFAC Atlantic  
Attn: Bryan Beck NAVFAC Mid-Atlantic Marine Corps  
6506 Hampton Blvd  
Norfolk, VA 23508

RE: Draft Non-Time Critical Removal Action  
Construction Completion Report for Soil and Groundwater  
Site UXO-01, ASR #2.64, D-6 Small Arms Range  
NCDENR Concurrence for No Further Action  
Marine Corps Base Camp Lejeune  
Jacksonville, North Carolina

Dear Mr. Beck:

The Superfund Section of the Division of Waste Management has completed its review of the Draft Non-Time Critical Removal Action Construction Completion Report for Soil and Groundwater at Site UXO-01, ASR #2.64, D-6 Small Arms Range. Section 5.0 of the report summarizes that the contaminated soil was removed to meet the cleanup goals and the subsequent ground water sampling events resulted in no exceedances of the North Carolina Ground Water Protection Standards. The conclusions state that "It is recommended that the groundwater monitoring wells be abandoned at the site and no further action is needed." NCDENR concurs with these recommendations.

If you have any questions, please contact me at (919) 707-8342.

Sincerely,

Marti Morgan  
Environmental Engineer  
NCDENR Superfund Section

Cc: Charity Rychak, MCB Camp Lejeune  
Gena Townsend, US EPA  
Randy McElveen





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4

ATLANTA FEDERAL CENTER  
61 FORSYTH STREET, S.W.  
ATLANTA, GEORGIA 30303-8960

May 9, 2013

NAVFAC Atlantic  
Attn: David Cleland: OPQE3  
USMC North Carolina IPT, EV Business Line  
6506 Hampton Blvd  
Norfolk, VA 23508-1273

SUBJ: MCB Camp Lejeune  
Draft Non-Time Critical Removal Action  
Completion Report  
Site UXO-01 ASR #2.64 – D6 Small Arms Range

Dear Mr. Cleland:

The Environmental Protection Agency (EPA) has completed its review of the above subject document. Based on the information presented, EPA agrees with the recommendation of "no further action" for the site. Also, EPA agrees that the groundwater monitoring wells are no longer needed and should be appropriately abandoned.

If there are any questions, I can be reached at (404) 562-8538.

Sincerely,

Gena Townsend

Gena D. Townsend  
Senior Project Manager

Digitally signed by Gena Townsend  
DN: cn=Gena Townsend, ou=Superfund Division,  
Federal Facilities Branch, ou=Environmental  
Protection Agency, email=townsend.gena@epa.gov,  
c=US  
Date: 2013.05.09 10:49:01 -0400

cc: Marti Morgan, NCDENR  
Charity Rychak, MCB Camp Lejeune